# Optical Disk Market Survey for the NAS Source Build Machine

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National Aeronautics and Space Administration

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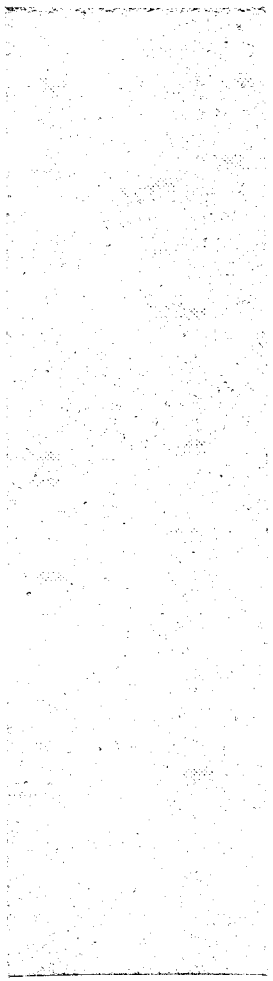

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# Optical Disk Market Survey for the NAS Source Build Machine

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*Abstract*

*The purpose of this communication is to summarize a recent investigation into three erasable optical disk drives for the NAS source build machine– Wk200. Features and costs of these optical drives are discussed. This survey has established that the "best valued" equipment is provided by the R Squared Corporation. Therefore, it is recommended that two OptiXchange packages be purchased from R Squared Corporation at a total cost of $13,090.00 ($6,545.00 each). These optical disk subsystems will be used for the distribution of the SGI operating system built at NAS.*

## 1.0 Introduction

The SGI Cypress (4.0) Operating System has been successfully built at NAS. A complete distribution set (15 products) of fifteen 1/4 inch tapes weighs more than ten pounds. There is a need for a more portable backup mechanism to turn over the OS built at NAS to RNS for installations.

Starting with 4.0, SGI releases its operating system in Read-Only Compact Disk which weighs only a few ounces. This CD release is preferred over the 1/4" archive tapes for its portability. Unfortunately, there is not an erasable CD drive that can be purchased to produce a CD such as the SGI's operating system release CD.

Two alternatives have been considered for distribution purposes; the Exabyte™ 8 mm tape drive and the erasable optical disk drive. It is concluded that the optical disk is preferred over the Exabyte tape because it is a random access device while the Exabyte tape drive is a streaming (sequential) device. It is more efficient to use the optical disk than the Exabyte tape.

The optical cartridge makes an excellent storage media for the operating system source, and the problems associated with archive tape backup can be avoided. The data storage lifetime, in excess of 25 years, is another advantage. The erasable optical disk becomes the most viable solution because of its storage capacity, portability, affordability and ease of administration.

## 2.0 Erasable Optical Disk Drive Specifications

This section briefly outlines the specifications of the three erasable optical drive subsystems under investigation. Features and cost comparisons of these three subsystems can be found in Table 1 and Table 2.

### 2.1 Introl™ 1 GB 5-1/4 inch Erasable Optical Drive Subsystem

The latest Introl 1 GB Erasable Optical Subsystem comes with a Maxoptix Tahiti II 5-1/4 inch Erasable Optical Disk Drive, the Introl SCSI-FLEX Software Driver, cables and enclosure. Its storage capacity on a 5-1/4" cartridge is 1.024 GB (unformatted). Currently, hardware platforms supported by the host-specific SCSI-FLEX Software Driver include SUN, SGI, Solbourne, Evans and Sutherland, and IBM RISC System 6000 workstations. The software integration procedure is considered routine. System administrators should not have problems with the integration.

The Introl 1 GB Erasable Optical Drive Subsystem costs $4,995.00. A 1 GB erasable cartridge costs $270.00. The on-site extended and enhanced warranty is $600.00 per year. The total cost is $5,865.00.

### 2.2 Ten X Technology, Inc.™ OptiXchange 940 Optical Subsystem

The Ten X OptiXchange™ 940 Multi-Function Optical Subsystem includes the Panasonic™ LF-7014 5-1/4 inch Erasable Optical Drive and the Ten X OCU™ 300

Hardware Caching Interface. It supports both the 1 GB erasable cartridge and the 940 MB Write-Once cartridge. The 940 optical subsystem can be used on SUN, SGI, IBM and Macintosh computers. The subsystem is compatible with UNIX, SUN OS, ULTRIX as well as DOS and Xenix.

The data transfer rate of the Panasonic optical drive is 400 KB per second. The OCU 300 Hardware Caching Interface is capable of increasing the system throughput by on-board data buffering and caching. It also provides a virtual increase in media capacity through on-the-fly data compression. The typical compression ratio is from 2:1 to 5:1.

The unique Ten X Hardware Interface feature eliminates the need for special software drivers and modifications to the operating system. When this unit is connected to the SCSI port of the SGI workstation, it operates on the SGI native SCSI driver like a standard Winchester disk. Limited effort is required for integration.

The complete 940 Subsystem costs $5,695.00. With a 15% government discount, the net cost is $4,840.75. A one GB erasable media costs $210.00 and the yearly extended warranty costs $1,080.00. The total cost for one subsystem is $6,135.75.

### 2.3 R Squared Ten X Optical Disk Drive Subsystem

R Squared Corporation is a distributor for Ten X Technology, Inc. Its OptiXchange package is based on the Ten X OptiXchange 940 Subsystem. The only difference is that Ten X Technology uses a Panasonic LF-7014 Erasable Optical Disk Drive, while R Squared uses a Tahiti II Erasable Optical Disk Drive which is the latest product from Maxoptix. The Ten X OCU 300 Hardware Caching Interface is included. This hardware interface feature cannot be found in any other product currently on the market. The data transfer rate of the Tahiti II drive is 1.2 MB per second and the storage capacity is 1 GB.

This subsystem cost is $5,200.00 and the cartridge cost is $295.00. The yearly extended warranty is $1,050.00. The total cost is $6,545.00.

| Supplier | Introl Corporation | Ten X Technology, Inc. | R Squared Corporation |
|---|---|---|---|
| Subsystem | Introl 1 GB Erasable Optical System | OptiXchange 940 Multi-Function Optical Subsystem | Ten X Erasable Optical Subsystem |
| Optical Drive | Maxoptix Tahiti II 5-1/4 inch Erasable Optical Drive | Panasonic LF-7014 5-1/4 inch Erasable Optical Drive | Maxoptix Tahiti II 5-1/4 inch Erasable Optical Drive |
| Hardware Interface | None | Ten X OCU 300 Hardware Caching Interface | Ten X OCU 300 Hardware Caching Interface |
| Software Driver | Introl SCSI-FLEX | Not Required | Not Required |
| Data Compression | None | 2:1 to 5:1 | 2:1 to 5:1 |
| Cartridge Capacity | 1 GB Erasable | 1 GB Erasable and 940 MB Write-Once | 1 GB Erasable and 940 MB Write-Once |
| Substained Data Transfer Rate | 1.2 MB per second | 410 KB per second | 1.2 MB per second |
| Cable and Chassis | Yes | Yes | Yes |
| Interface Standard | SCSI-2 | SCSI-2 | SCSI-2 |

Table 1. Features of the Three Erasable Optical Drive Subsystems Under Investigation

| Product Descriptions | Unit Cost | Net Price |
|---|---|---|
| Introl Corporation | | |
| Introl 1 GB Erasable Optical Subsystem | $4.995.00 | $4,995.00 |
| Maxoptix Tahiti II 5-1/4" Drive | | |
| SCSI_FLEX Software Driver | | |
| 1 GB Polycarbon Erasable Optical Media | $270.00 | $270.00 |
| Yearly On-site Extended Warranty | $600.00 | $600.00 |
| | Total Cost | $5,865.00 |
| Ten X Technology, Inc. | | |
| Ten X OptiXchange 940 Multi-Function Optical Subsystem | $5,695.00 | $4,840.75 |
| (15% GSA discount available) | | |
| Ten X OCU 300S Hardware Caching Interface | | |
| 1 GB Panasonic LF-7014 5-1/4" Erasable Optical Drive | | |
| 1 GB Erasable Media | $245.00 | $210.00 |
| Extended One Year Warranty with replacement unit | $1,080.00 | $1,080.00 |
| | Total Cost | $6,135.75 |
| R Squared Corporation | | |
| Ten X Erasable Optical Subsystem | $5,200.00 | $5,200.00 |
| Ten X OCU 300S Hardware Caching Interface | | |
| 1 GB Maxoptix Tahiti II 5-1/4 inch Erasable Optical Drive | | |
| 1 GB 512K Sectors Optical Cartridge (Glass) | $295.00 | $295.00 |
| Extended One Year Warranty For Maxtor Tahiti II | $600.00 | $600.00 |
| Extended One Year Warranty For OCU 300S Unit | $450.00 | $450.00 |
| | Total Cost | $6,545.00 |

Table 2. Cost Comparisons of the Erasable Optical Disk Subsystems Under Investigation

## 3.0 Analysis

The complete system cost for the Introl Subsystem is $5,865.00, the cost for the Ten X package is $6,135.75, and the cost for the R Squared package is $6,545.00. These costs include hardware, storage medium and an extra year of extended warranty. Since the cost of the three optical subsystems under investigation are competitive, the performance and ease of administration become the deciding factors in the evaluation.

The Introl Optical Subsystem is a more traditional product. It requires a host specific device driver to operate the optical drive. This disadvantage makes the optical drive non-transportable. If the optical subsystem is purchased for the SGI workstation, it cannot be used on a SUN workstation without a SUN software driver. A SCSI-FLEX driver for the SUN is quoted at $900.00 by Introl Corporation. It becomes unrealistic to invest additional money in purchasing additional device drivers for every platform at NAS.

Introl also has a licensing scheme that limits the use of the SCSI-FLEX driver on a particular CPU. It requires a $50 charge to migrate the drive from one CPU to another CPU. This charge becomes significant because each SGI workstation ( a total of more than 100 ) at NAS has the potential to use this drive for the operating system installation purposes. Although it is unlikely that this drive will be moved around very often, it is unrealistic to invest a significant amount of money in this licensing scheme.

Because of the non-transportability nature and the unrealistic licensing scheme of this product, this subsystem is not a viable solution.

On the other hand, the Ten X OCU Caching Hardware Interface allows the optical drive to function like a Winchester drive. The Ten X Optical subsystem can be used on any platform without the need of a host dependent software driver. This subsystem can be used on any of the SGI, SUN and Macintosh platforms. With the on-board Data Compression Processor, data can be compressed at a ratio from 2:1 to 5:1. It translates to at least double the storage capacity of the cartridge.

The R Squared Ten X package is basically the same as the Ten X OptiXchange 940 package. The only difference is the optical drive. The Maxoptix Tahiti II drive used in the R Square package is superior than the Panasonic drive used in the Ten X package. Its data transfer rate (1.2 MB/s) is three times higher than that of the Panasonic LF-7014 (400

KB/s). This drive also shows a higher reliability figure (30,000 hours versus 20,000 hours).

Ten X Technology has been contacted for the Maxoptix Tahiti II drive option. Unfortunately, Ten X does not package its product with the Tahiti II drive. Although the R Squared package is $409.25 more than the Ten X OptiXchange 940 package, the price difference is a cost-performance tradeoff. The R Squared package is preferred over the Ten X OptiXchange Subsystem.

## 4.0 Recommendations

Although the Introl Optical Subsystem has the lowest cost, it is the most conventional technology. The non-transportability nature and the unacceptable per-CPU licensing scheme of this product ruled out its feasibility in this application.

The Ten X OptiXchange 940 subsystem and the R Squared Ten X subsystem are basically the same. The difference between these two packages is that R Squared has substituted the Panasonic LF-7040 Optical Drive with the Maxoptix Tahiti II Erasable Optical Drive which is three times faster than the LF-7014. Also, the on-board Data Compression Processor makes the Ten X package more attractive than the Introl Subsystem. The typical data compression ratio range is 2:1 to 5:1.

Although the R Squared Ten X OptiXchange package is $409.25 more than the Ten X OptiXchange 940 package, the R Squared package is recommended. The extra cost is a trade-off for a more advanced technology.

Therefore, it is recommended that two OptiXchange packages be purchased from R Squared Corporation at a total cost of $13,090.00 ($6,545.00 each). These Optical disk subsystems will be used for the distribution of the SGI operating system built at NAS. One subsystem will be used by RND while the other one will be used by RNS.

## 6.0 Suppliers List

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